

## CLAIMS:

1. Method for combined sampling rate conversion and gain-controlled filtering of a digital signal, where an input signal is converted into a filtered output signal, comprising the steps of:
  - filtering the input signal with a first polyphase filter yielding a first
  - 5 intermediate signal,
  - filtering the input signal with a second polyphase filter yielding a second intermediate signal,
  - multiplying said second intermediate signal with a gain control signal yielding a third intermediate signal, and
  - 10 - adding said third intermediate signal to said first intermediate signal yielding said output signal.
2. Method according to claim 1, characterized in that the first polyphase filter has a low-pass filter characteristic in the frequency domain.
- 15 3. Method according to one of the claims 1-2, characterized in that the second polyphase filter has a band-pass filter characteristic in the frequency domain.
4. Method according to one of the claims 1-3, characterized in that the gain
- 20 control signal is derived from a signal that is generated by filtering the input signal with a third polyphase filter.
5. Method according to claim 4, characterized in that the third polyphase filter is a differentiating filter.
- 25 6. Method according to one of the claims 1-5, characterized in that the filter coefficients for each multiplication tap of the polyphase filters are stored in look-up-tables and are cyclically read out in response to a phase control signal.

7. Method according to one of the claims 1-6, characterized in that said polyphase filters share the shift register.
8. Method according to one of the claims 1-7, characterized in that said input  
5 signal is a video signal, that said input signal is transformed into the linear light domain by gamma correction before it is filtered with the polyphase filters and that said output signal is transformed back to the gamma domain by anti-gamma correction.
9. Method according to one of the claims 1-7, characterized in that said input  
10 signal is a video signals, that gamma correction is performed for each output value of the registers within at least the first and second polyphase filter and that said output signal is transformed back to the gamma domain by anti-gamma correction.
10. Method according to one of the claims 1-9, characterized in that  
15 - said input signal is a Standard Definition Television (SDTV) signal,  
- said output signal is a High Definition Television (HDTV) signal,  
- said first polyphase filter performs spatial scaling,  
- said second polyphase filter performs peaking and/or LTI; and  
- that said third polyphase filter performs edge steepness detection.
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11. Device for combined sampling rate conversion and gain-controlled filtering of a digital signal, where an input signal is converted into a filtered output signal, comprising:  
- a shift register comprising a multiplicity of registers that are jointly controlled by a shift enable signal for storing consecutive values of said digital signal,  
25 - circuitry for multiplying the output of each register with filter coefficients of a first type and summing the products yielding a first intermediate signal,  
- circuitry for multiplying the output of each register with filter coefficients of a second type and summing the products yielding a second intermediate signal,  
- circuitry for multiplying the second intermediate signal with a gain control  
30 signal yielding a third intermediate signal,  
- circuitry for adding the first and third intermediate signals yielding said output signal, and  
- means to cyclically change the filter coefficients of the first and second type in response to a phase control signal.

12. Device according to claim 11, characterized in that the filter coefficients of the first type are chosen so that the filter DC gain is always one.

5 13. Device according to one of the claims 11-12, characterized in that the filter coefficients of the second type are chosen so that the filter DC gain approaches zero.

14. Device according to one of the claims 11-13, characterized in that the device further comprises circuitry for multiplying the output of each register with filter coefficients  
10 of a third type and summing the products yielding a signal that serves as a basis for said gain control signal.

15. Device for combined sampling rate conversion and gain-controlled filtering of a digital signal, where an input signal is converted into a filtered output signal, comprising:  
15 - a shift register comprising a multiplicity of registers that are jointly controlled by a shift enable signal for storing consecutive values of said digital signal,  
- circuitry for forming the differences between the outputs of adjacent registers, for multiplying these differences with filter coefficients of a first type and for summing the products and the output of at least one register yielding a first intermediate  
20 signal,  
- circuitry for multiplying said differences with filter coefficients of a second type and for summing the products yielding a second intermediate signal,  
- circuitry for multiplying the second intermediate signal with a gain control signal yielding a third intermediate signal,  
25 - circuitry for adding the first and third intermediate signals yielding said output signals, and  
- means to cyclically change the filter coefficients of the first and second type in response to a phase control signal.

30 16. Device according to claim 15, characterized in that the device further comprises circuitry for multiplying said differences with filter coefficients of a third type and for summing the products yielding a signal that serves as a basis for said gain control signal.

17. Device according to one of the claims 11-16, characterized in that the device further comprises look-up-tables for generating the filter coefficients of the first and second type in response to a phase control signal.

5 18. Device according to one of the claims 11-17, characterized in that the device further comprises one gamma correction circuit for applying gamma correction to said input signal and one anti-gamma correction circuit for applying anti-gamma correction to said output signal.

10 19. Device according to one of the claims 11-17, characterized in that the device further comprises multiple gamma correction circuits for applying gamma correction to the outputs of said registers and one anti-gamma correction circuit for applying anti-gamma correction to said output signal.

15 20. Device according to one of the claims 14, 16, 18 or 19 characterized in that  
- said input signal is a Standard Definition Television (SDTV) signal,  
- said output signal is a High Definition Television (HDTV) signal,  
- said filter coefficients of the first type implement spatial scaling,  
- said filter coefficients of the second type implement peaking and/or LTI and;  
20 - that said filter coefficients of the third type implement edge steepness  
detection.

21. A computer program product directly loadable into the internal memory of a digital computer, comprising software code portions for performing the steps of claim 1 when  
25 said product is run on a computer.